WATER RESOURCES REVIEW for

AUGUST

1975

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

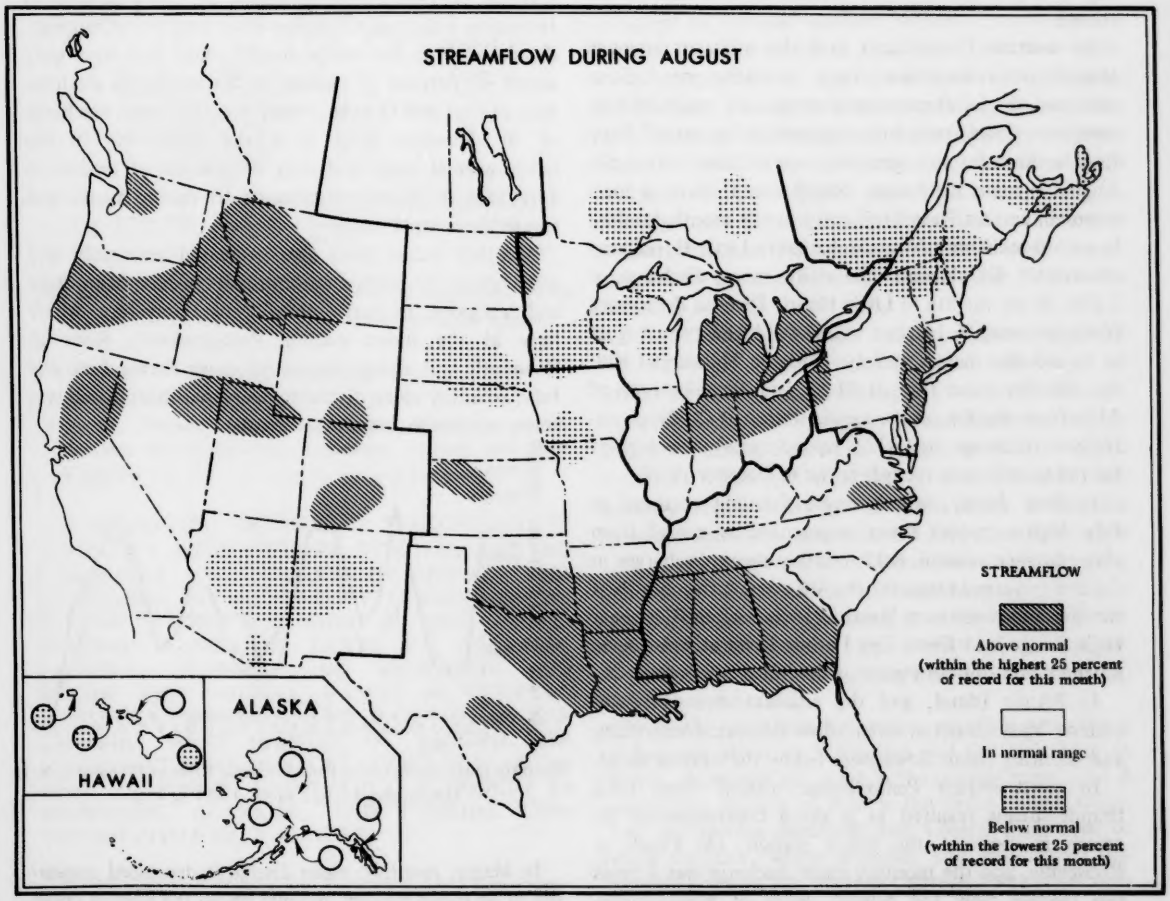
STREAMFLOW AND GROUND–WATER CONDITIONS

Streamflow increased in some eastern and central States where intense rains occurred and in some western States having continued snowmelt runoff from higher elevations; but generally decreased seasonally in other areas.

Flows remained in the above-normal range in large areas in southeastern and northwestern United States, and in the below-normal range in smaller areas in eastern Canada, some central States, and in parts of Hawaii.

Monthly or daily mean discharges were highest of record in some streams in Florida, Louisiana, Montana, and Mississippi, and lowest of record in parts of Nova Scotia, Ontario, Hawaii, and New Mexico.

Flooding occurred in Alabama, Florida, Illinois, Indiana, Mississippi, and Wisconsin.



NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW DECREASED SEASONALLY EXCEPT IN PARTS OF QUEBEC, NEW YORK, AND PENNSYLVANIA, AND GENERALLY WAS LESS THAN MEDIAN IN THE NORTHERN PART OF THE REGION. FLOWS REMAINED IN THE BELOW-NORMAL RANGE IN PARTS OF NOVA SCOTIA AND QUEBEC AND IN THE ABOVE-NORMAL RANGE IN PARTS OF CONNECTICUT AND NEW JERSEY.

High carryover flows from July helped hold monthly mean discharges in the above-normal range at index stations in parts of Connecticut and New Jersey, where August mean flows generally were twice the medians. In western Maryland, where mean flow during July at the index station, Choptank River near Greensboro, was 16 times median, monthly mean discharge decreased seasonally during August but was 5 times the median for the month.

In western Connecticut and the adjacent areas of Massachusetts and New York, monthly mean flows remained in the above-normal range as a result of high carryover flows from July, augmented by runoff from thundershowers, and generally were about twice the August median discharges. Rapid runoff from a local storm in eastern New York early in the month resulted in record-breaking stream discharges in Little Hoosic and Moordener Kill basins. The daily mean discharge of 2,210 cfs on the 8th in Little Hoosic River at Petersburg (drainage area, 56.1 square miles) was highest for August in record that began in July 1951. In Moordener Kill, the monthly mean flow of 39 cfs, and the daily mean of 232 cfs on the 8th, at the gaging station at Castleton-on-Hudson (drainage area, 32.6 square miles) were highest for the month since records began in October 1957.

In New Jersey, where severe flooding occurred in July, high carryover flows, augmented by runoff from above-average rainfall, held monthly mean discharges in the above-normal range for the 4th consecutive month at the two index stations, South Branch Raritan River near High Bridge and Great Egg Harbor River at Folsom, in northern and southern parts of the State, respectively.

In Rhode Island, and the adjacent area of southeastern Massachusetts, streamflow decreased seasonally and monthly mean flows were below the normal range.

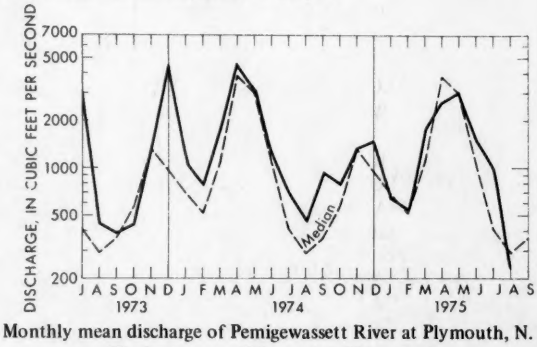
In northwestern Pennsylvania, runoff from local thunderstorms resulted in a sharp contraseasonal increase in flow at the index station, Oil Creek at Rouseville, and the monthly mean discharge was 3 times the median flow for August. Flow of Monongahela River, in southwestern Pennsylvania, also increased sharply and the monthly mean discharge of 7,470 cfs at Braddock (drainage area, 7,337 square miles) was almost twice the August median.

In the northern part of the region, flows generally were below median, and at the index station St. Marys River at Stillwater, Nova Scotia (drainage area, 523 square miles), the monthly mean discharge of 20.2 cfs, and the daily mean of 11.3 cfs on the 22d, were lowest for August since records began in July 1915. Also in Nova Scotia, monthly mean flows at the index stations, Northeast Margaree River at Margaree Valley and La Have River at West Northfield, decreased sharply and were only 66 and 43 percent of median, respectively.

In the adjacent Province of New Brunswick, the monthly mean discharge of 244 cfs in Upsalquitch River at Upsalquitch (drainage area, 877 square miles) was 47 percent of median, in the below-normal range, and only 12 percent greater than the lowest August monthly mean flow in 45 years of record.

In southern Quebec, monthly mean flows at the index stations, Harricana River at Amos, St. Francois River at Hemming Falls, and Coulonge River near Fort Coulonge, decreased into the below-normal range and were only about 40 percent of median at the latter two stations. Also in southern Quebec, where monthly mean discharge of St. Maurice River at Grand Mere was in the below-normal range and only 44 percent of median in July, flow increased contraseasonally during August and was in the normal range.

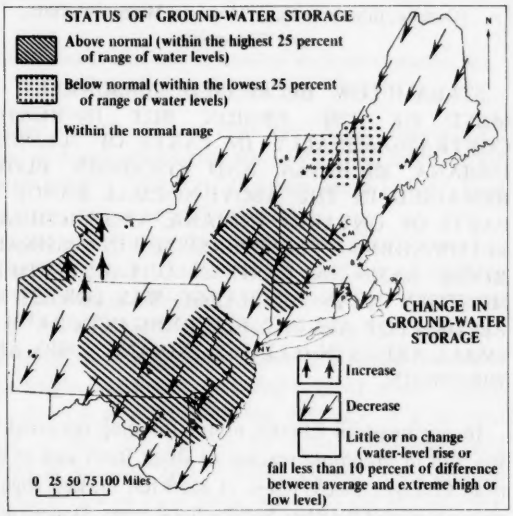
Monthly mean flows also decreased seasonally and were below the normal range in parts of New Hampshire and Vermont. In north-central New Hampshire, where flow at the index station, Pemigewassett River at Plymouth, was above the normal range during June and July, monthly mean discharge decreased sharply and was below median in August (see graph).



Monthly mean discharge of Pemigewassett River at Plymouth, N. H. (Drainage area, 622 sq mi; 1,611 sq km)

In Maine, monthly mean discharge decreased seasonally at all index stations and was below the normal range in the central and southern parts of the State.

Ground-water levels continued to decline seasonally in most of the region (see map); one exception was an area of rising levels in extreme western New York State. Levels near monthend were above average in extreme western New York; in large four-State area in and southeast of southeastern and south-central Pennsylvania; and in a five-State area centered on western Massachusetts and adjacent east-central parts of New York. Levels were below average in northern New Hampshire and adjacent parts of western Maine and northern Vermont.



Map shows ground-water storage near end of August and change in ground-water storage from end of July to end of August.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW DECREASED SEASONALLY IN KENTUCKY, WEST VIRGINIA, VIRGINIA, AND THE CAROLINAS, AND IN PARTS OF GEORGIA AND TENNESSEE, BUT INCREASED ELSEWHERE IN THE REGION. FLOWS REMAINED IN THE ABOVE-NORMAL RANGE IN PARTS OF ALABAMA, FLORIDA, GEORGIA, AND MISSISSIPPI, AND BELOW THE NORMAL RANGE IN CENTRAL KENTUCKY. MONTHLY AND DAILY MEAN DISCHARGES WERE HIGHEST OF RECORD FOR AUGUST AT SOME INDEX STATIONS IN FLORIDA AND MISSISSIPPI. END-OF-JULY FLOODING IN MISSISSIPPI, ALABAMA, AND FLORIDA CONTINUED INTO EARLY AUGUST.

In Florida and Mississippi, high carryover flows from July, augmented by runoff from rains during August, resulted in record-breaking monthly and daily mean discharges at some index stations. For example, in northwestern Florida, the monthly mean flow of 3,980 cfs, and the daily mean of 24,400 cfs on the 1st, at the index station Shoal River near Crestview (drainage area, 474 square miles) were highest for the month in record that began in July 1938. Also, in southeastern Mississippi the monthly mean discharge of 11,340 cfs, and the daily mean of 23,800 cfs on the 7th and 8th, in Pascagoula River at Merrill (drainage area, 6,600 square miles), were highest for August in record that began in October 1930. In the west-central part of the State, the monthly mean flow of 4,159 cfs in Big Black River near Bovina (drainage area, 2,810 square miles) was highest for the month in record that began in February 1936.

In Alabama, flows increased and were above the normal range at all index stations. In Conecuh River basin, where flooding occurred at the end of July and in early August, the monthly mean discharge of 1,498 cfs at Brantley (drainage area, 492 square miles) was 5 times the median flow for August.

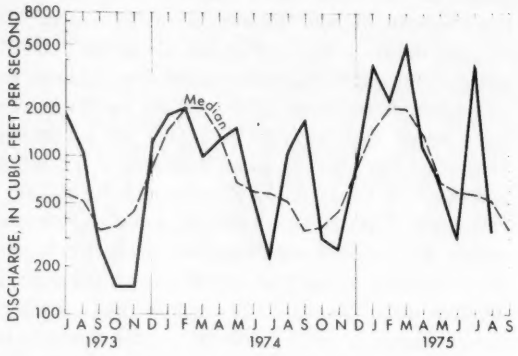
Except in extreme northern Georgia, monthly mean flows at index stations in that State were above the normal range and 2 to 3 times median flows for August. In Altamaha River basin in eastern Georgia, monthly mean discharge at Doctortown was in the above-normal range for the 6th consecutive month. In western Georgia, and the adjacent area of eastern Alabama, monthly mean flow of Apalachicola River, as measured at Chattahoochee, Fla., near the Florida-Georgia boundary, was in the above-normal range for the 7th time in the past 8 months.

In northeastern Florida and the adjacent area of southeastern Georgia, monthly mean discharge of Suwannee River, as measured at Branford, Fla., increased sharply and was above the normal range. Also in northern Florida, flow of Silver Springs was unchanged at 640 cfs; 82 percent of normal. In west-central Florida, monthly mean discharge of Peace River at Arcadia increased seasonally but remained below median for the 12th consecutive month. In the southeastern part of the State, flow of Miami Canal at Miami decreased 22 cfs, to 150 cfs; 45 percent of normal. In southwestern Florida, flow southward through the Tamiami Canal outlets, 40–mile bend to Monroe, decreased 119 cfs, to 154 cfs; 41 percent of normal.

In northeastern South Carolina, monthly mean flows of Lynches River at Effingham and Pee Dee River at Peedee, decreased and were in the normal range after 8 consecutive months of flow in the above-normal range.

In the eastern Piedmont and Coastal Plain area of North Carolina, where monthly and daily mean discharges during July at the index station Neuse River near Clayton, were highest of record for the month, flow

decreased sharply in August and the monthly mean was only 63 percent of median (see graph). In the adjacent



Monthly mean discharge of Neuse River near Clayton, N.C. (Drainage area, 1,140 sq mi; 2,953 sq km)

basin of Cape Fear River, where the mean discharge during July at William O. Huske Lock near Tarheel also was highest of record for that month and was 6 times median, monthly mean flow decreased sharply during August to only 71 percent of median. Rainfall in this part of the State was reported to be about one fourth of normal for August. In the western Piedmont and Tennessee River basin areas of western North Carolina, flows decreased seasonally but runoff from several thunderstorms helped hold monthly mean discharges above median and in the normal range at the index stations, South Yadkin River at Mocksville and French Broad River at Asheville.

In southeastern Virginia, high carryover flow from the near-record-high monthly mean discharge in Nottoway River near Stony Creek during July (9 times median) contributed to the above-normal monthly mean discharge at that index station during August. Elsewhere, at index stations in eastern and northern parts of the State, monthly mean discharges also decreased seasonally but remained above median.

In extreme western Virginia, and the adjacent area of southern West Virginia, monthly mean flows in North Fork Holston River near Saltville, Va., and Greenbrier River at Alderson, W. Va., decreased sharply and were only 71 percent of median. At other index stations in West Virginia, and in the adjacent area of northern Kentucky, monthly mean flows were greater than median, but in south-central Kentucky, where flow of Green River at Munfordville was below the normal range and only 42 percent of median in July, flow continued to decrease, remained in the below-normal range, and was 44 percent of median in August.

Ground-water levels generally declined seasonally. Local exceptions included rises in a few southeastern counties of West Virginia, in the eastern Piedmont of North Carolina, in the Sparta Sand in the Jackson area of central Mississippi, and in extreme southern Alabama and northern Florida. Monthend levels were above average in much of Kentucky, Alabama, and North Carolina (except in the Coastal Plain); were near or above average in most of West Virginia (except below average in few southeastern counties); and were below average in southeastern Florida and in the Coastal Plain of North Carolina.

WESTERN GREAT LAKES REGION

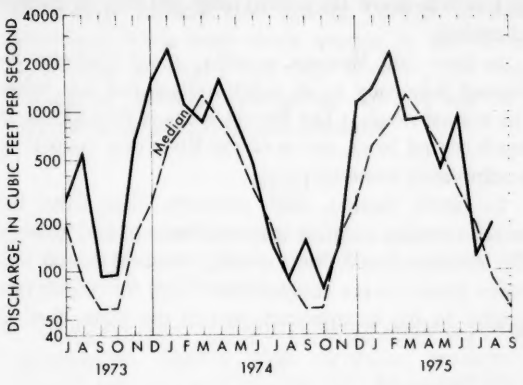
[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW DECREASED SEASONALLY IN MOST OF THE REGION BUT INCREASED CONTRASEASONALLY IN PARTS OF ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN. FLOWS REMAINED IN THE ABOVE-NORMAL RANGE IN PARTS OF ONTARIO, INDIANA, AND MICHIGAN. BELOW-NORMAL FLOW PERSISTED IN MISSINAIBI RIVER BASIN IN EASTERN ONTARIO WHERE MONTHLY MEAN DISCHARGE WAS LOWEST OF RECORD FOR AUGUST. FLOODING OCCURRED IN SMALL AREAS IN ILLINOIS, INDIANA, OHIO, AND WISCONSIN.

In northeastern Illinois, minor flooding occurred on the 22d in the upper reaches of Rock River and in and near Chicago. Rock River at Rockton crested slightly above National Weather Service flood stage. Downstream on Rock River, monthly mean discharge at the index station near Joslin decreased seasonally and was in the normal range. In the central part of the State, runoff from intense thunderstorms in Sangamon River basin at midmonth resulted in a monthly mean discharge at Monticello that was about 3 times median and in the above-normal range. In northwestern Illinois, and the adjacent area of southwestern Wisconsin, monthly mean flow of Pecatonica River (tributary to Rock River), as measured at Freeport, Illinois, decreased seasonally and remained in the normal range.

In Indiana, intense thunderstorms crossed the State frequently during the month, resulting in flooding in and near Bedford and Bloomington in south-central Indiana, on the 4th and 16th, respectively, and in and near Marion and Tipton in the north-central part of the State, on the 23d and 26th, respectively. Reflecting this storm runoff, monthly mean discharge at the index station, Mississinewa River at Marion, increased contraseasonally, was more than twice the August median, and was above the normal range (see graph on page 5).

In northeastern Ohio, major flooding occurred in the Cleveland area August 24, resulting in extensive property



Monthly mean discharge of Mississinewa River at Marion, Ind. (Drainage area, 682 sq mi; 1,766 sq km)

damage and the loss of four lives. Rapid runoff from about 5 inches of rain that fell in Big Creek basin caused a peak stage of 16.2 feet, discharge about 10,000 cfs, at the gaging station near Cleveland.

Rapid runoff from localized storms that occurred in the region August 22d resulted in small-stream flooding in Trempealeau County, in west-central Wisconsin, where as much as 5 inches of rain in a 12-hour period was reported. Trempealeau River at Arcadia crested at gage height, 8.64 feet, and discharge of about 15,000 cfs, which is approximately the discharge of a 50–year flood at that site. Damage to streets, businesses, and homes in Arcadia, and to roads, culverts, and railroad bridges in nearby rural areas, was reported to have been extensive. In north-central, and east-central parts of the State, monthly mean flows of Chippewa, and Fox Rivers, decreased seasonally and were in the below-normal range at index stations at Chippewa Falls, and Rapide Croche Dam near Wrightstown, respectively. Monthly mean discharges at those two stations were less than median in July. Also, in the adjacent area of Michigan's Upper Peninsula, flow of Sturgeon River near Sidnaw decreased seasonally and the monthly mean discharge was below the normal range.

In southwestern Minnesota, flow of Minnesota River decreased sharply during August and the monthly mean discharge of 826 cfs at the index station near Jordan (drainage area, 16,200 square miles) was only 45 percent of median. In the northwestern part of the State, monthly mean flow of Buffalo River near Dilworth remained in the above-normal range and was 4 times the August median as a result of high carryover flow from the record-breaking July discharge which was 37 times the median flow for that month.

In southeastern Ontario, and the adjacent area of Michigan's Lower Peninsula, monthly mean flows increased contraseasonally and were above the normal range as a result of runoff from thunderstorms during the latter part of the month. Elsewhere in southern Ontario, flows decreased seasonally and the monthly and daily mean discharges of 366 cfs and 178 cfs, respectively, at the index station, Missinaibi River at Mattice (drainage area, 3,450 square miles) were lowest for the month since records began in May 1920.

Ground-water levels declined in most of the region, but rose in northern Minnesota and in a few other areas where heavy rains caused contraseasonal ground-water recharge. Monthend levels were generally above average in northern Minnesota; near average in Wisconsin; and below average in southern Minnesota. In the key well near Hanska (Brown County), 32 feet deep, in south-central Minnesota 75 miles southwest of Minneapolis, the level was lowest for end of August since records began in 1943, but was about 6 feet above the lowest level of record measured in February 1956; seasonal lows in this well occur usually in January or February.

MIDCONTINENT

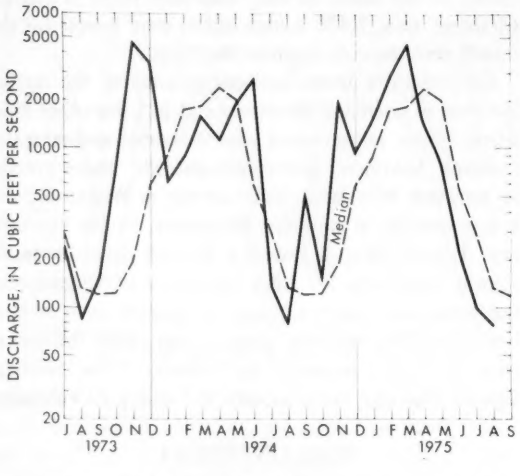
[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW INCREASED CONTRASEASONALLY AND REMAINED ABOVE THE NORMAL RANGE IN PARTS OF ARKANSAS, KANSAS, LOUISIANA, AND TEXAS; AND DECREASED INTO THE BELOW-NORMAL RANGE IN PARTS OF IOWA, MISSOURI, NEBRASKA, AND SOUTH DAKOTA. MONTHLY AND DAILY MEAN FLOWS WERE HIGHEST OF RECORD FOR AUGUST IN PARTS OF LOUISIANA. MINOR FLOODING OCCURRED IN OKLAHOMA.

In Louisiana, streamflow generally increased contraseasonally and remained above the normal range for the 4th consecutive month. At the index station, Amite River near Denham Springs (drainage area, 1,280 square miles) in southeastern Louisiana, the monthly mean flow of 4,479 cfs and the daily mean of 14,800 cfs on the 3d, were highest for August in record that began in October 1938. In the southwestern part of the State, the monthly mean discharge of 1,649 cfs in Calcasieu River near Oberlin (drainage area, 753 square miles) was about 18 times the August median flow and was in the above-normal range for the 4th consecutive month. Cumulative runoff at this index station from May through August was 6 times the median cumulative runoff for that period.

In southern Arkansas, flow at the index station Saline River near Rye, also increased contraseasonally as a result of runoff from several storms during the month,

the August median. In the northern part of the State, flow of Buffalo River near St. Joe decreased seasonally and remained below median for the 5th consecutive month (see graph).



Monthly mean discharge of Buffalo River near St. Joe, Ark. (Drainage area, 829 sq mi; 2,147 sq km)

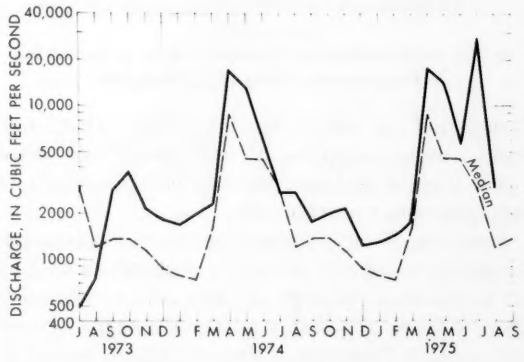
In southwestern Oklahoma, high carryover flow from July contributed to the above-normal monthly mean discharge (7 times median) in Washita River near Durwood. This was the 3d consecutive month of flow in the above-normal range at this index station. In the north-central part of the State, rapid runoff from intense thunderstorms resulted in minor flooding along some streams August 25 and 26.

In Texas, flows generally decreased seasonally but were above the normal range in Guadalupe, Neches, and North Bosque River basins. In the south-central part of the State, monthly mean discharge of Guadalupe River near Spring Branch remained in the above-normal range for the 10th consecutive month. No significant flooding was recorded in the State during August.

In Kansas, Nebraska, and South Dakota, flows increased in some basins and decreased in others. For example, in northwestern Kansas, runoff from thunderstorms early in August resulted in a sharp increase in flow in Saline River basin and the monthly mean discharge at the index station near Russell was 5 times the median discharge for August. In northeastern Nebraska, monthly mean flow of Elkhorn River at Waterloo decreased into the below-normal range and was only 59 percent of median, and in southeastern South Dakota runoff from above-normal rainfall in Big Sioux River basin resulted in a contraseasonal increase in flow and a monthly mean discharge one-and-one-half times the August median. Mean discharge at that index station in July was below the normal range and only 35 percent of median.

In Iowa and Missouri, monthly mean discharge decreased seasonally at all index stations and was below the normal range in Des Moines River at Fort Dodge in north-central Iowa, and in Grand River near Gallatin in northwestern Missouri.

In North Dakota, high carryover flow from the record-breaking monthly mean discharge in Red River of the North at Grand Forks during July, held flow at that index station in the above-normal range for August (see graph). In the southwestern part of the State, flow in



Monthly mean discharge of Red River of the North at Grand Forks, N.Dak. (Drainage area, 30,100 sq mi; 78,000 sq km)

Cannonball River basin decreased seasonally but remained above median for the 5th consecutive month.

In south-central Manitoba, monthly mean discharge of Waterhen River below Waterhen Lake also decreased seasonally and was in the normal range. The level of Lake Winnipeg at Gimli averaged 716.86 feet above mean sea level, 2.74 feet higher than the August long-term mean, 0.01 foot higher than last month, and 1.22 feet lower than a year ago.

Ground-water levels declined seasonally in most of the region. Exceptions included rises in levels in northeastern and north-central Nebraska, and at El Dorado, Arkansas (Sparta Sand industrial aquifer) and at Austin, Texas (Edwards Limestone). Also, in southwestern Louisiana, the level rose an additional 7½ feet, totalling a 16-foot rise since irrigation pumping ended in July. Monthend levels were near average in North Dakota except for a continuation of above-average levels in the southeastern part of the State. In Iowa, monthend levels in water-table wells were below average in the eastern part and near or above average in the central and western parts of the State. In north-central and northeastern Nebraska, monthend levels were near long-term averages. In the industrial aquifer of central and southern Arkansas (Sparta Sand), levels were below average at

Pine Bluff (alltime low) and El Dorado. In Texas, monthend levels were above average in the Edwards Limestone at Austin and San Antonio, and below average at Houston (Evangeline aquifer) and at an alltime low at El Paso (bolson deposits).

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

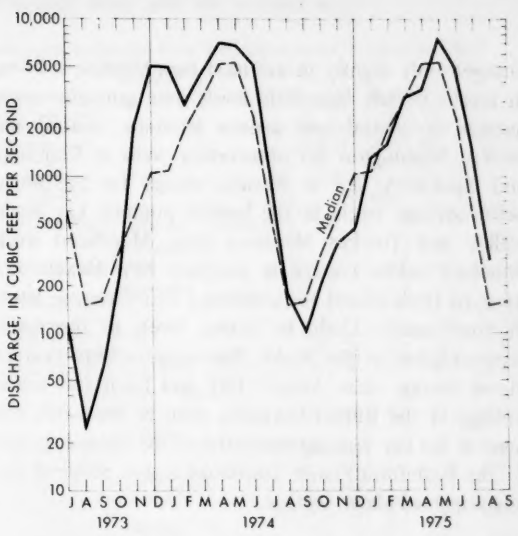
STREAMFLOW DECREASED SEASONALLY BUT REMAINED ABOVE THE NORMAL RANGE IN PARTS OF ALL STATES IN THE REGION EXCEPT ARIZONA AND NEW MEXICO WHERE FLOW IN SOME STREAMS DECREASED INTO THE BELOW-NORMAL RANGE. RECORD-HIGH FLOWS OCCURRED IN SOUTH-CENTRAL MONTANA AND RECORD-LOW FLOWS OCCURRED IN EAST-CENTRAL NEW MEXICO.

High carryover flow from July resulted in a daily mean discharge of 18,100 cfs on August 1 in Yellowstone River at Billings (drainage area, 11,795 square miles) in south-central Montana, the highest daily mean for August in 47 years of record. The monthly mean discharge at Billings, and at other index stations in the State, decreased seasonally, but as a result of high carryover flow from July and runoff from above-normal precipitation during August, remained above the normal range for the 3d consecutive month. In Marias River near Shelby (drainage area, 3,242 square miles), in northwestern Montana, the monthly mean flow of 1,090 cfs was 3 times the median for August and only 5 percent less than the maximum August monthly mean discharge in 67 years of record.

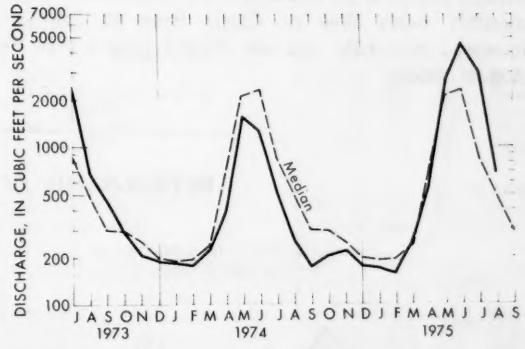
Monthly mean flows also decreased seasonally but remained above the normal range in Idaho and in parts of California, Colorado, Nevada, Oregon, Utah, Washington, and Wyoming, as a result of runoff from late snowmelt or from above-normal rainfall. Mean flows have been in the above-normal range for as long as 4 consecutive months at some index stations in these States, such as John Day River at Service Creek in north-central Oregon (see graph), and for 3 consecutive months at other stations, such as Animas River at Durango in southwestern Colorado (see graph).

In Alberta and British Columbia, monthly mean flows decreased seasonally at all index stations and generally were slightly greater than August medians.

In Arizona and east-central New Mexico, monthly mean flows decreased contraseasonally and were below the normal range as a result of below-average rainfall during the month. In Little Colorado River basin, the



Monthly mean discharge of John Day River at Service Creek, Oreg. (Drainage area, 5,090 sq mi; 13,200 sq km)



Monthly mean discharge of Animas River at Durango, Colo. (Drainage area, 692 sq mi; 1,792 sq km)

monthly mean discharge of 16.0 cfs at the index station near Cameron, Arizona (drainage area, 26,500 square miles) was only 5 percent of the August median. In Pecos River basin, in east-central New Mexico, the monthly mean flow of 22.0 cfs at the index station at Santa Rosa (drainage area, 2,650 square miles) was only 10 percent of median for the month and lowest for August in 61 years of record.

In northern Utah, the level of Great Salt Lake fell 0.70 foot during the month (to 4,200.45 feet above mean sea level), 0.80 foot higher than a year ago, and 2.45 feet higher than the average level for August.

Contents of most major reservoirs were above average at monthend. The net decrease in storage in the Colorado River Storage Project was 503,900 acre-feet during the month.

Ground-water levels generally declined in Washington, Montana, and in north-central and east-central Nevada;

changed only slightly in southern New Mexico; and rose in most of Utah. Monthend levels were generally above average in central and eastern Montana, central and eastern Washington (in observation wells at Cashmere and Spokane), and in Nevada except for continued below-average levels in the heavily pumped Las Vegas Valley and Truckee Meadows areas. Monthend levels remained below average in southern New Mexico and most of Utah except for continued above-average levels in southeastern Utah. In Idaho, levels in the south representative of the Snake Plain aquifer were near or above average near Atomic City and Eden and below average in the Rupert-Minidoka area; in the north, the level in the key well representative of the alluvial aquifer of the Rathdrum Prairie, continued a slow seasonal rise and remained above average.

ALASKA

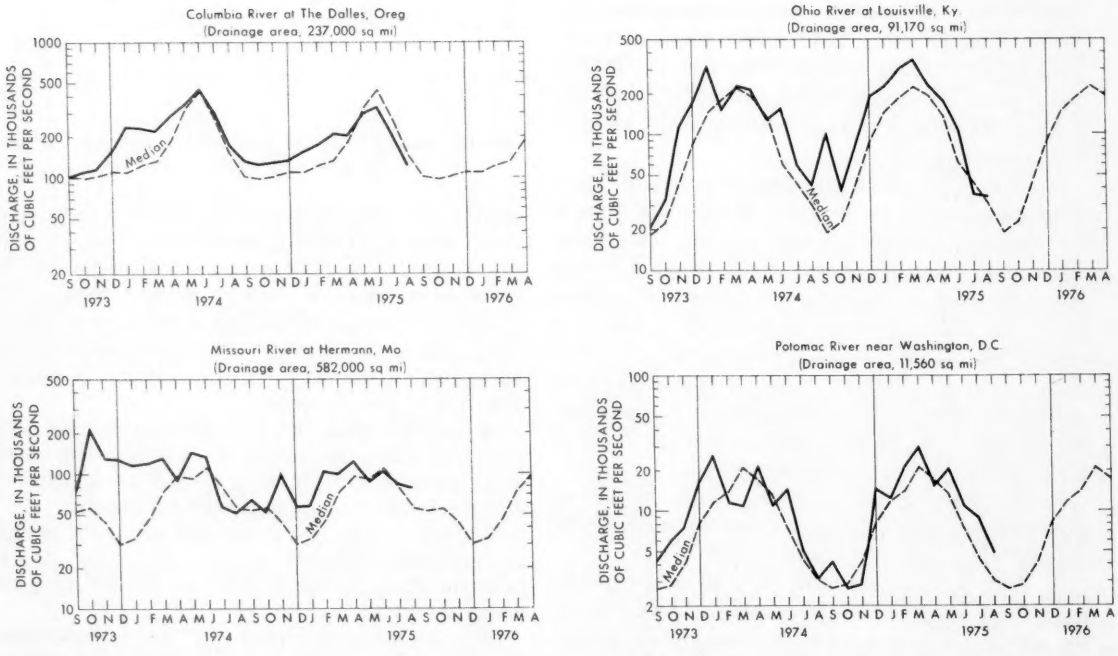
Streamflow decreased seasonally and was less than median except in the east-central part of the State where monthly mean flow of Chena River at Fairbanks increased seasonally and was slightly greater than the August median.

Ground-water levels in the Anchorage area generally rose in the deep confined aquifers although heavy pumping caused lowering of levels in some wells. In the Kenai area, levels generally did not change.

HAWAII

Streamflow decreased at some index stations and increased at others, but generally was below the normal range. The monthly mean discharge of 16.7 cfs in East Branch of North Fork Wailua River near Lihue (drainage area, 6.2 square miles), on the island of Kauai, was the lowest for August since records began in July 1912, and was only 45 percent of median. At the index stations on the islands of Oahu and Hawaii, Kalihi Stream near Honolulu and Waiakea Stream near Mountain View, monthly mean flows remained below the normal range for the 3d consecutive month and were 26 and 37 percent of median, respectively. In the eastern part of the island of Maui, where monthly mean discharge at the index station, Honopou Stream near Huelo, was in the below-normal range in May, June, and July, flow increased as a result of runoff from occasional showers during August and was in the normal range. In the central part of that island very dry conditions were reported to be continuing.

HYDROGRAPHS OF FOUR LARGE RIVERS



USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF AUGUST 1975

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of July 1975	End of Aug. 1975	End of Aug. 1974	Average for end of Aug.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	57	47	43	48	223,400 (a)
QUEBEC					
Allard (P)	88	82	85	67	280,600 ac-ft
Gouin (P)	75	76	85	63	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	81	64	77	66	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	94	88	84	84	3,330 mcf
Lake Francis (FPR)	73	81	86	83	4,326 mcf
Lake Winnipesaukee (PR)	97	87	79	74	7,200 mcf
VERMONT					
Harriman (P)	83	75	78	70	5,060 mcf
Somerset (P)	92	86	83	76	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	89	83	77	78	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	82	73	71	71	34,270 mcf
Indian Lake (FMP)	104	102	95	71	4,500 mcf
New York City reservoir system (MW)	97	91	83	.....	547,500 mg
NEW JERSEY					
Wanaque (M)	101	100	71	74	27,730 mg
PENNSYLVANIA					
Pymatuning (FMR)	95	93	95	86	8,191 mcf
Wallenpaupack (P)	73	67	69	64	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	100	99	93	88	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	93	87	91	88	12,580 mcf
Narrows (Badin Lake) (P)	97	93	97	99	5,617 mcf
High Rock Lake (P)	97	82	80	74	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	93	82	83	70	70,300 mcf
Lakes Marion and Moultrie (P)	93	84	87	66	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	77	79	76	65	75,360 mcf
GEORGIA					
Burton (PR)	95	88	98	86	104,000 ac-ft
Sinclair (MPR)	95	88	76	86	214,000 ac-ft
Lake Sidney Lanier (FMPR)	65	63	66	58	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	100	96	96	85	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	54	41	46	47	1,156,000 cfsd
Douglas Lake (FPR)	43	28	48	48	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	68	59	72	68	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	62	49	64	54	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	61	50	72	69	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	85	75	86	75	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	66	48	75	66	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	49	41	38	35	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	107	102	96	.....	22,640,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	79	74	63	78	127,600 ac-ft
Bell Fourche (I)	68	38	25	40	185,200 ac-ft
Lake Francis Case (FIP)	85	76	77	77	4,834,000 ac-ft
Lake Oahe (FIP)	99	99	81	.....	22,530,000 ac-ft
Lake Sharpe (FIP)	102	99	102	98	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	94	95	97	97	477,000 ac-ft
MIDCONTINENT REGION--Continued					
NEBRASKA					
Lake McConaughy (IP)	79	70	67	68	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	98	93	81	77	2,378,000 ac-ft
Keystone (FPR)	99	93	90	89	661,000 ac-ft
Tenkiller Ferry (FPR)	103	102	92	89	628,200 ac-ft
Lake Altus (FIMR)	100	96	29	45	134,500 ac-ft
Lake O'The Cherokees (FPR)	94	84	84	83	1,492,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	105	100	91	91	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	100	100	40	43	386,400 ac-ft
Canyon (FMR)	...	94	100	.....	385,600 ac-ft
International Amistad (FIMPW)	...	100	...	.....	3,497,000 ac-ft
International Falcon (FIMPW)	100	89	56	.....	2,667,000 ac-ft
Livingston (IMW)	100	99	95	68	1,788,000 ac-ft
Possum Kingdom (IMPRW)	97	95	97	101	569,400 ac-ft
Red Bluff (PI)	45	43	7	23	307,000 ac-ft
Toledo Bend (P)	98	92	85	80	4,472,000 ac-ft
Twin Buttes (FIM)	98	95	30	9	177,800 ac-ft
Lake Kemp (IMW)	70	80	43	86	268,000 ac-ft
Lake Meredith (FMW)	50	48	47	40	821,300 ac-ft
Lake Travis (FIMPRW)	98	91	100	72	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	100	100	99	.....	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	97	99	100	98	5,232,000 ac-ft
Lake Chelan (PR)	100	99	100	94	676,100 ac-ft
Lake Cushman (P)	102	101	98	96	359,500 ac-ft
Lake Merwin (P)	106	106	106	102	246,000 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	84	68	65	57	1,235,000 ac-ft
Coeur d'Alene Lake (P)	100	100	99	72	238,500 ac-ft
Pend Oreille Lake (FP)	99	100	100	99	1,561,000 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (MP)	85	70	66	57	4,282,000 ac-ft
WYOMING					
Boysen (FIP)	100	94	91	86	802,000 ac-ft
Buffalo Bill (IP)	102	90	89	90	421,300 ac-ft
Keyhole (F)	78	72	73	41	199,900 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	77	67	65	45	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	18	364,400 ac-ft
Taylor Park (IR)	101	98	80	78	106,200 ac-ft
Colorado–Big Thompson project (I)	91	82	78	64	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell: Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	87	85	76	.....	31,280,000 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	95	91	83	61	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	87	80	87	68	1,000,000 ac-ft
Hetch Hetchy (MP)	98	87	89	68	360,400 ac-ft
Isabella (FIR)	52	37	60	30	551,800 ac-ft
Pine Flat (FI)	62	43	52	40	1,014,000 ac-ft
Clair Engle Lake (Lewiston) (P)	95	90	88	82	2,438,000 ac-ft
Lake Almanor (P)	97	91	98	53	1,036,000 ac-ft
Lake Berryessa (FIMW)	92	89	90	81	1,600,000 ac-ft
Millerton Lake (FI)	61	35	30	41	503,200 ac-ft
Shasta Lake (FIPR)	94	86	88	73	4,377,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	91	85	85	63	744,600 ac-ft
NEVADA					
Rye Patch (I)	108	105	73	.....	157,200 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	76	76	74	71	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	12	8	29	12	1,093,000 ac-ft
Salt and Verde River system (IMPR)	61	55	52	37	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	30	28	40	81	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	23	19	15	24	2,539,000 ac-ft

[a]Thousands of kilowatt-hours

FLOW OF LARGE RIVERS DURING AUGUST 1975

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	August 1975					
				Monthly discharge (cfs)	Percent of median monthly discharge, 1941–70	Change in discharge from previous month (percent)	Discharge near end of month		
							(cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	2,624	76	-33	4,200	2,700	31
1–3185	Hudson River at Hadley, N.Y	1,664	2,791	583	53	0	400	260	31
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,450	1,570	109	-44	.....	.....	....
1–4635	Delaware River at Trenton, N.J	6,780	11,360	6,521	153	-49	6,200	4,000	26
1–5705	Susquehanna River at Harrisburg, Pa.	24,100	33,670	8,575	113	-44	6,280	4,100	31
1–6465	Potomac River near Washington, D.C.	11,560	[1]10,640	4,880	159	-46	2,800	1,800	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	4,847	2,120	71	-85	1,320	850	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,098	7,280	119	-66	4,760	3,100	27
2–2260	Altamaha River at Doctortown, Ga.	13,600	13,380	15,900	254	+10	10,300	6,700	25
2–3205	Suwannee River at Branford, Fla	7,740	6,775	9,440	175	+52	7,650	4,900	31
2–3580	Apalachicola River at Chattahoochee, Fla.	17,200	21,690	29,500	207	+13	21,400	13,800	28
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	21,700	16,400	345	+62	8,600	5,600	25
2–4895	Pearl River near Bogalusa, La	6,630	8,533	16,620	603	+246	4,750	3,100	31
3–0495	Allegheny River at Natrona, Pa	11,410	[1]18,700	4,590	98	-8	4,060	2,600	26
3–0850	Monongahela River at Braddock, Pa.	7,337	[1]11,950	7,470	181	+79	6,400	4,100	26
3–1930	Kanawha River at Kanawha Falls, W.Va.	8,367	12,370	3,720	89	-41	3,140	2,000	25
3–2345	Scioto River at Higby, Ohio	5,131	4,337	1,081	120	-38	870	560	31
3–2945	Ohio River at Louisville, Ky[2]	91,170	110,600	34,800	116	-4	26,700	17,300	26
3–3775	Wabash River at Mount Carmel, Ill.	28,600	26,310	9,910	116	-38	12,100	7,800	31
3–4690	French Broad River below Douglas Dam, Tenn.	4,543	[1]6,528	3,850	94	-2	.....	.....	....
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,142	1,650	76	-21	.....	.....	....
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[3]	299,000	239,100	283,000	112	-2	281,000	182,000	31
050115	St. Maurice River at Grand Mere, Quebec.	16,300	24,900	13,000	81	+103	13,200	8,500	26
5–0825	Red River of the North at Grand Forks N. Dak.	30,100	2,439	2,958	246	-89	2,330	1,500	31
5–3300	Minnesota River near Jordan, Minn ..	16,200	3,306	826	45	-83	585	380	28
5–3310	Mississippi River at St. Paul, Minn ...	36,800	[1]10,230	7,166	100	-71	6,580	4,300	27
5–3655	Chippewa River at Chippewa Falls, Wis.	5,600	5,062	2,058	72	-36	.....	.....	....
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,457	4,497	91	-31	.....	.....	....
5–4465	Rock River near Joslin, Ill	9,520	5,288	3,812	137	-34	3,600	2,300	31
5–4745	Mississippi River at Keokuk, Iowa ...	119,000	61,210	.....	.....	.....	.....	.....	....
5–4855	Des Moines River below Raccoon River at Des Moines, Iowa.	9,879	3,796	1,434	94	-66	2,000	1,300	31
6–2145	Yellowstone River at Billings, Mont.	11,795	6,754	9,130	172	-76	7,000	4,500	31
6–9345	Missouri River at Hermann, Mo	528,200	78,480	76,550	138	-7	80,000	51,700	24
7–2890	Mississippi River near Vicksburg, Miss.[4]	1,144,500	552,700	351,600	111	-29	330,000	213,000	31
7–3310	Washita River near Durwood, Okla ..	7,202	1,379	2,393	661	-28	820	530	31
8–3130	Rio Grande at Otowi Bridge, near San Ildefonso, N.Mex.	14,300	1,530	770	92	-62	.....	.....	....
9–3150	Green River at Green River, Utah ...	40,600	6,369	4,705	154	-74	4,750	3,100	28
11–4255	Sacramento River at Verona, Calif ...	21,257	18,370	17,000	197	+13	18,100	11,700	28
13–2690	Snake River at Weiser, Idaho	69,200	17,670	11,370	106	-12	13,400	8,700	25
13–3170	Salmon River at White Bird, Idaho ..	13,550	11,060	8,531	157	-73	11,000	7,100	25
13–3425	Clearwater River at Spalding, Idaho ..	9,570	15,320	6,832	190	-72	14,700	9,500	25
14–1057	Columbia River at The Dalles, Oreg.[5]	237,000	194,000	125,000	82	-40	.....	.....	....
14–1910	Willamette River at Salem, Oreg	7,280	23,370	7,880	140	-8	9,230	6,000	27-31
15–5155	Tanana River at Nenana, Alaska	25,600	24,040	52,680	95	-18	37,000	24,000	31
8MF005	Fraser River at Hope, British Columbia.	78,300	95,300	123,000	103	-43	127,000	82,000	28

[1] Adjusted.

[2] Records furnished by Corps of Engineers.

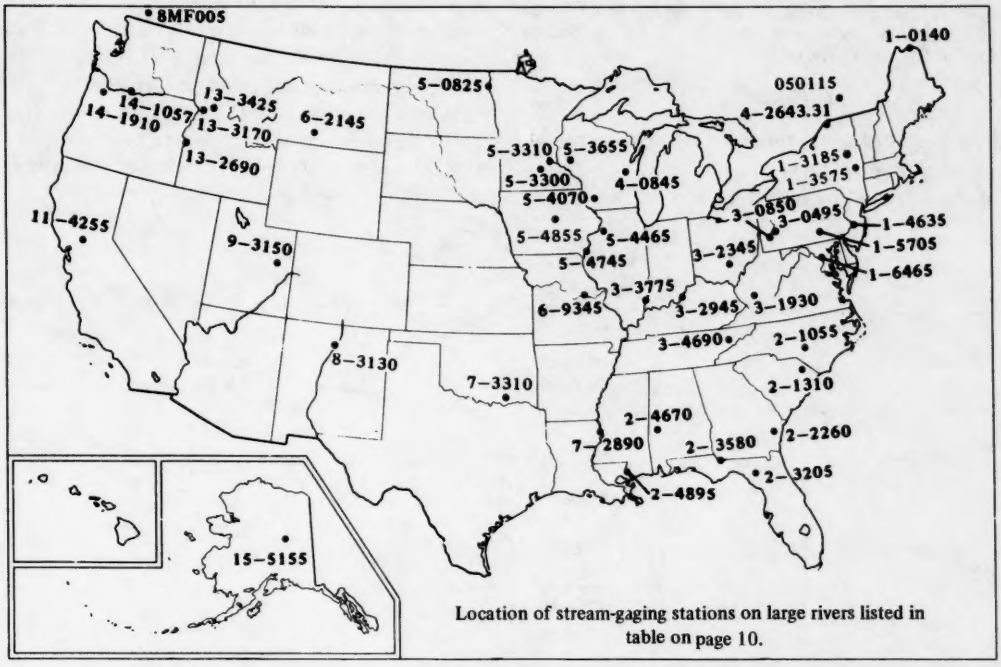
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.

[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.

[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

SELECTED STREAM-GAGING STATIONS ON LARGE RIVERS



Location of stream-gaging stations on large rivers listed in table on page 10.

WATER RESOURCES REVIEW
AUGUST 1975

Based on reports from the Canadian and U.S. field offices; completed September 5, 1975

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for August based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for August 1975 is compared with flow for August in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for August is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range*. In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the August flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of August. Water level in each key observation well is compared with average level for the end of August determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels*, unless described otherwise, are from the end of July to the end of August.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 metre 1 mile = 1.609 kilometres
1 acre = 0.4047 hectare = 4,047 square metres
1 square mile (sq mi) = 259 hectares = 2.59 square kilometres (sq km)
1 acre-foot (ac-ft) = 1,233 cubic metres
1 million cubic feet (mcf) = 28,320 cubic metres
1 cubic foot per second (cfs) = 0.02832 cubic metres per second = 1.699 cubic metres per minute
1 second-foot-day (cfsd) = 2,447 cubic metres per day
1 million gallons (mg) = 3,785 cubic metres = 3.785 million litres
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic metres per minute = 3,785 cubic metres per day

AN INTRODUCTION TO THE PROCESSES, PROBLEMS, AND MANAGEMENT OF URBAN LAKES

The abstract and illustrations below are from the report, *An introduction to the processes, problems, and management of urban lakes,* by L.J. Britton, R.C. Averett, and R.F. Ferreira: U.S. Geological Survey Circular 601-K, 22 pages, 1975. This circular may be obtained free on request to U.S. Geological Survey, National Center, Reston, Virginia 22092.

ABSTRACT

Lakes are bodies of water formed in depressions on the earth's surface, and as such, act as depositories for a variety of chemical and biological materials. The study of lakes has become increasingly prevalent in recent years. Lakes are a valuable resource, and their multiple uses have made them susceptible to water-quality problems such as algal blooms, sediment deposition, and fish kills. These problems are products of the eutrophication process (enrichment, aging, and extinction of lakes), which is often accelerated by man (fig. 1). Therefore, it becomes important to understand the properties and processes of lakes (fig. 2) which govern lake enrichment, and the measures available to control enrichment.

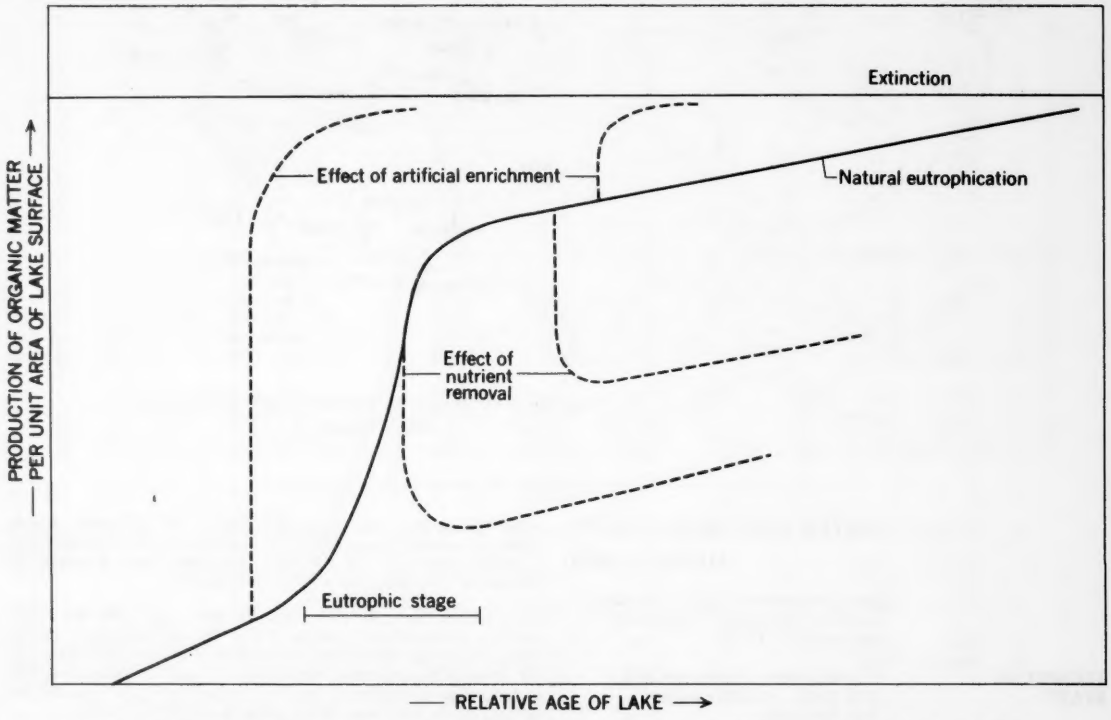

Figure 1.—Effect of man upon the eutrophication of lakes. After Greeson, 1971; modified from Hasler, 1947.

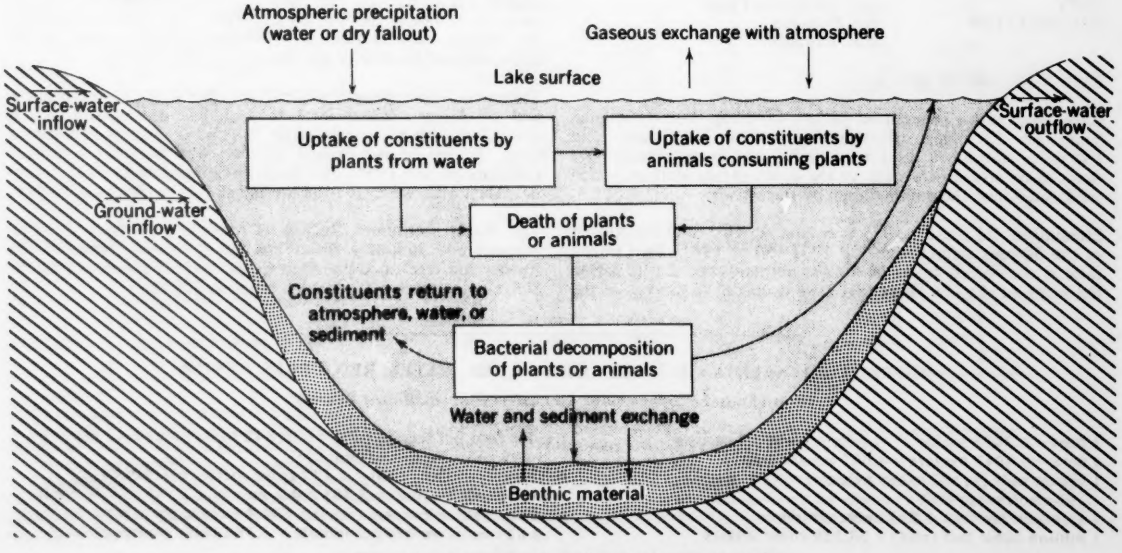

Figure 2.—Sources and cycling of elements in a lake.